Environmental Science and Policy 89 (2018) 348–356

Contents lists available at ScienceDirect

Environmental Science and Policy

journal homepage: www.elsevier.com/locate/envsci

Uncertainties and policy challenges in implementing Land Degradation Neutrality in Russia

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ARTICLE INFO

Keywords:
Land degradation assessment
Land monitoring
Russia
Land policy
LDN baseline

ABSTRACT

The theoretical concept of Land Degradation Neutrality (LDN) developed by the UNCCD needs testing at the national level. We studied the uncertainties and challenges for LDN application in Russia as a country with high variability of natural and social-economic conditions. Having a great influence on the political decision-making and institutional politics is one of the challenges, and in this regard we found: (i) in national legislation: inadequate conceptualization of "land" as a natural entity, and of the processes of "land degradation" for non-agricultural lands, especially occurring in boreal and arctic regions; (ii) the need for a differentiated approach to establishing LDN baseline for different regions within the country with different causes and trends of degradation revealed through the great territory; (iii) the importance of assessing accumulated degradation risks as the basis for articulating priorities in LDN "response hierarchy"; (iv) the importance of a differentiated approach for selecting time intervals for determining the LDN baseline, taking into account long-term natural and socio-economic processes. Despite the well-established State Land Monitoring system in Russia, these circumstances identify the following tasks required to achieve LDN objectives: (i) zoning of the country's territory in accordance with the classification of "like for like" exchanges in various biophysical and socio-economic conditions; (ii) considering the role of natural restoration processes in the planning of LDN activities in natural and managed systems. Principles that appear important for developing national LDN policy are: close interaction with climate change adaptation programs, detailed land degradation assessment for non-agricultural lands, keeping administrative division of territory as the basis for LDN spatial monitoring.

1. Introduction

Elaborating key sustainable development strategies and policies at the national level always begins with the creation of a universal theoretical approach based on some tentative assumptions, and the concept of Land Degradation Neutrality (LDN) is no exception. The translation of these assumptions into action demands ongoing refinements with due regard to local specific features. In respect of LDN national target setting, Russia can be considered as a complex region with a high diversity of natural landscapes and socioeconomic conditions, which can hardly be represented with simple policy models. Russia also has complicated and multifocal systems of land monitoring and land management, with a complex history of land rearrangement and land use changes.

As the largest country in the world, Russia occupies about 11% of the global land area, and thus has a global responsibility for sustainable conservation and maintenance of land resources. Russia is an active party to multilateral environmental agreements particularly the UN Convention to Combat Desertification (UNCCD), which is a custodian of the target 15.3 of Sustainable Development Goals: "By 2030, combat desertification, restore degraded land and soil, including land affected by desertification, drought and floods, and strive to achieve a land-degradation-neutral world" (UN, 2015).

The identification of the land degradation problems and their scientific analysis are not novel for Russia. Modern soil science originated in Russia in the late 19th century from the ideas of Vasily Dokuchaev (Moon, 2005; Zonn, 1979) as a scientific response to catastrophic consequences of severe drought in grain-producing regions of the Russian Empire. Science-based land use practices elaborated throughout 20th century had a positive influence on economic development. Nevertheless, after the collapse of Soviet Union in 1991, Russia has faced new land degradation issues (Dobrovol'skij and Kust, 1996; Rosinformagroteh, 2008; Barsukova and Zvyagintsev, 2015). The wise and sound adoption of the LDN concept with respect to national

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https://doi.org/10.1016/j.envsci.2018.08.010
Received 29 April 2018; Received in revised form 25 July 2018; Accepted 15 August 2018
Available online 04 September 2018
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peculiarities can help to overcome land degradation problems.

The LDN concept was officially presented in 2011 at the UNCCD 10th Conference of the Parties and then widely recognized at the United Nations Conference on Sustainable Development (UN, 2012). In 2015 the UNCCD declared the concept of LDN as part of the core agenda of the Convention and defined LDN as: "a state whereby the amount and quality of land resources, necessary to support ecosystem functions and services and enhance food security, remains stable or increases within specified temporal and spatial scales and ecosystems" (UNCCD, 2015). In 2014, UNCDD launched an LDN Target Setting Programme (LDN TSP), which encompassed initially 14 countries, and currently more than 100 other parties have joined the process. Russia joined the LDN TSP in 2015; however, the country is encountering significant difficulties to establish national LDN targets and baseline because of policy challenges considered in this paper.

2. Objective

This paper focuses on the process of LDN adoption and implementation in Russia and the main associated challenges influencing national environmental and land policies. The Scientific Conceptual Framework (SCF) for LDN developed by UNCCD (Orr et al., 2017; Cowie et al., 2018) and the LDN rationale introduced in earlier publications (Chasek et al., 2015; Grainger, 2015; Stavi and Lal, 2015; Akhtar-Schuster et al., 2017; Kust et al., 2017) facilitate the deployment of the LDN theoretical model in practice. On the other hand, an attempt to operationalize the SCF at national level in Russia during the LDN TSP detected a number of challenges, which needed additional scientific assessment. The following narratives describe the most considerable challenges and uncertainties identified in the implementation of the LDN Target Setting Project:

- Basic terminology of LDN differs from official terminology used in Russia;
- Establishing a LDN baseline involves uncertainties in defining a concerted time period and spatial extent;
- Selection and use of core national LDN indicators;
- Institutional arrangements and integrated planning cycle for national LDN policy.

3. Results and discussion

3.1. Uncertainties and challenges related to the use of LDN basic terminology

Harmonization of national land degradation statistics with a global assessment primarily supposes closeness or similarity of basic definitions. In this regard, a challenge for Russia is connected with difficulties in the use of the basic terms of "land" and "land degradation", and their poor compatibility with globally accepted concepts. The Land Code of the Russian Federation (2001) as a main national law treats land as "a natural entity preserved as the most important component of nature, a natural resource used as a means of production in agriculture and forestry…and at the same time as an immovable property, the ownership and other rights relating to land" (Gosduma, 2001). While the land plot as "real estate" is clearly defined in the Land Code, the concept of land as the component of nature or as a natural resource, is not properly specified.

The history of land legislation in Russia after the collapse of the Soviet Union in 1991 testifies to non-uniform development of concepts with regard to different "categories of land". It leads to the absence of the unified concept of "land as a natural entity" in the legal framework. "Land degradation" is legally considered only for agricultural lands (Gosduma, 1998). As a result, official nationwide data on land degradation for other land use categories are not available in Russia. In this regard, the adoption of the LDN concept can serve as an effective measure not only to ensure consistency between national and global data, but also for harmonization and integration of national land statistics and assessments.

Concepts outside the Russian legal framework, such as "ecosystem services" and "land-based natural capital" are used in the LDN definition and its associated SCF. Though the terms of ecosystem services and natural capital are now actively involved in scientific discourses in Russia (Glazyrina, 2001; Lukyanchikov and Potravny, 2007; Bobylev and Zakharov, 2009), for the national LDN target setting they cannot be consider as policy options, representing only scientific interests.

3.2. LDN baseline for further land monitoring at the national level

Cowie et al. (2018) state that "the LDN baseline as … the initial value of each of the indicators used to monitor LDN…, the baseline values of the indicators at the start of the implementation of the policy … are compared to the values measured at the target date … to determine the change in land-based natural capital… Ideally, all countries would agree to use the same baseline period for tracking progress, to enhance comparability and assessment at the global scale". Our analysis evidence that these clear recommendations are difficult to apply in Russia. The main difficulties associated to establishing the LDN national baseline are discussed hereafter.

3.2.1. Diversity of natural and socioeconomic conditions

The Russian territory occupies about a third of the Eurasia landmass (with its 24% located in Eastern Europe and the rest in North Asia) and it extends (for 4000 km from north to south and more than 11,000 km in W-E direction) through several climate belts and landscape zones, from polar deserts to Mediterranean subtropics; 85 main administrative divisions called federal units vary in size from 860 km^2 to 3.08 million km^2 and comprise very diverse land use patterns: densely populated industrial and agricultural regions in the European part, Ural region and Southern Siberia contrast to virgin boreal forests and tundra of most of Siberia and Far East. Forest is the prevailing land category in Russia (about 2/3 of the country land area) and lands for agricultural purposes occupy 383.7 million ha or 22.4% (Fig. 1); about 60–65% of the territory is covered by permafrost (Rosgidromet, 2012).

We evaluated land use/land cover changes (LULCC) for the southern part of European Russia from 2000 to 2015 based on the interpretation of the European Space Agency's global Climate Change Initiative Land Cover dataset (ESA, 2017). The results obtained for the different federal units demonstrate a great diversity of natural and socioeconomic drivers of LULCC throughout the neighboring macro-regions of the Lower Volga and Eastern Caucasus (Fig. 2).

As well, our analysis shows that the same types of land cover transitions represented in Fig. 2 may be interpreted as positive for one region, and as negative in another geography; e.g. transition of "irrigated lands to shrub lands" or "abandonment of irrigated lands" can lead to restoration of salinized soils, or can be regarded as a negative transition because of water shortage due to the use of non-effective and out-of-date irrigation technologies.

According to LDN SCF "counter balancing should occur only within individual land types, distinguished by land potential, to ensure "like-for-like" exchanges", and "to increase the likelihood that there is no net loss in ecosystem services". Hence, the LDN vision does not imply a mechanism of mutual compensation of different processes out of the integrated biophysical systems, i.e. the rehabilitation of agricultural lands cannot compensate a reduction of a forested area. As well, restoration of severely eroded soils is not a compensation measure for land loss under chemical pollution.

It is, hence, an urgent task for Russia to categorize lands taking into account specific regional features and establishing main criteria of land quality and interpret all the LULC changes as positive and negative. The existing scheme of land degradation assessment is used only for agricultural lands but it is yet to be elaborated for other land categories. To

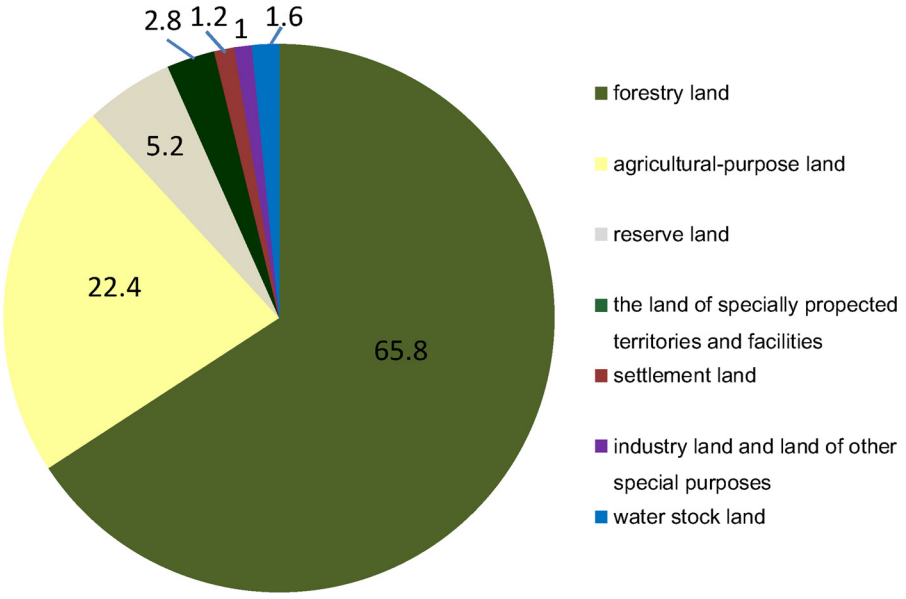

Fig. 1. Distribution of land resources in Russia at January 2017 (Rosreestr, 2017).

prevent and combat land degradation there is high demand for a consistent national regionalization scheme according "like-for-like" exchanges and careful interpretation of land cover transitions and other LDN indicators according to the real diversity of natural and socio-economic conditions.

3.2.2. Diversity of drivers and processes of land degradation

The diversity of natural conditions in Russia leads to a varied and heterogeneous set of negative processes revealed in different ecosystems throughout the country (Minprirody, 2017). These can be natural processes such as erosion, salinization, grass and forest fires or human-induced and even artificial processes (e.g. soil pollution and contamination, the formation of technogenic deposits). Russia has a comprehensive State Land Monitoring system for controlling negative degradation processes and risk assessment. The well-established monitoring scheme has been elaborated for lands under agricultural

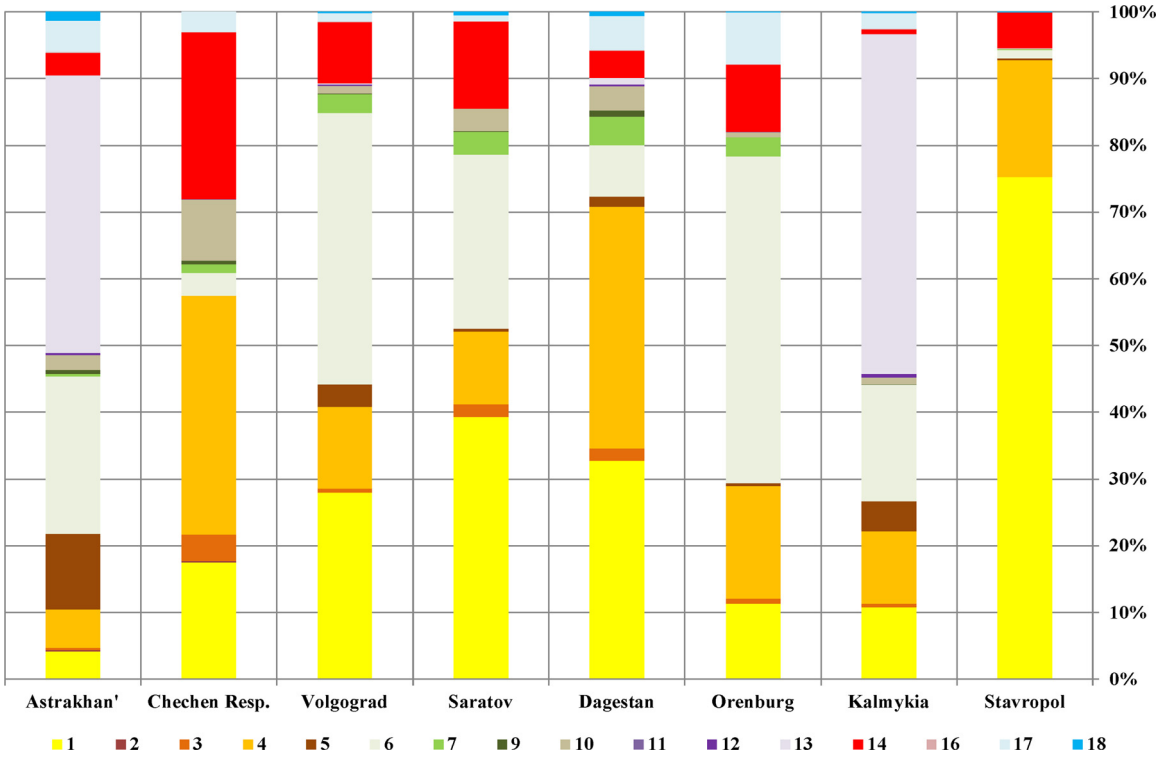

Fig. 2. LULCC in 2000–2015 for the several administrative divisions of the Lower Volga and Eastern Caucasus. Significant land cover transitions types grouped and interpreted as: 1. Natural vegetation to non-irrigated croplands. 2. Natural vegetation to irrigated croplands 3. Forest fragmentation at the expense of agricultural lands (transitions between classes of "mosaics"). 4. Grassland fragmentation at the expense of agricultural lands. 5. Grasslands to sparse vegetation areas. 6. All croplands to grasslands. 7. Non-irrigated croplands to shrublands and forests 8. Irrigated croplands to shrublands and forests. 9. Grasslands to forests. 10. Forests to shrublands. 11. All croplands to bare areas. 12. Forests and shrublands to bare areas. 13. Bare areas to sparse vegetation and shrublands. 14. Expansion of built-up areas. 15.Changes in functional forest types. 16. Shrublands to forests. 17. Water to bare lands or lands under sparse vegetation. 18. Bare lands to water.

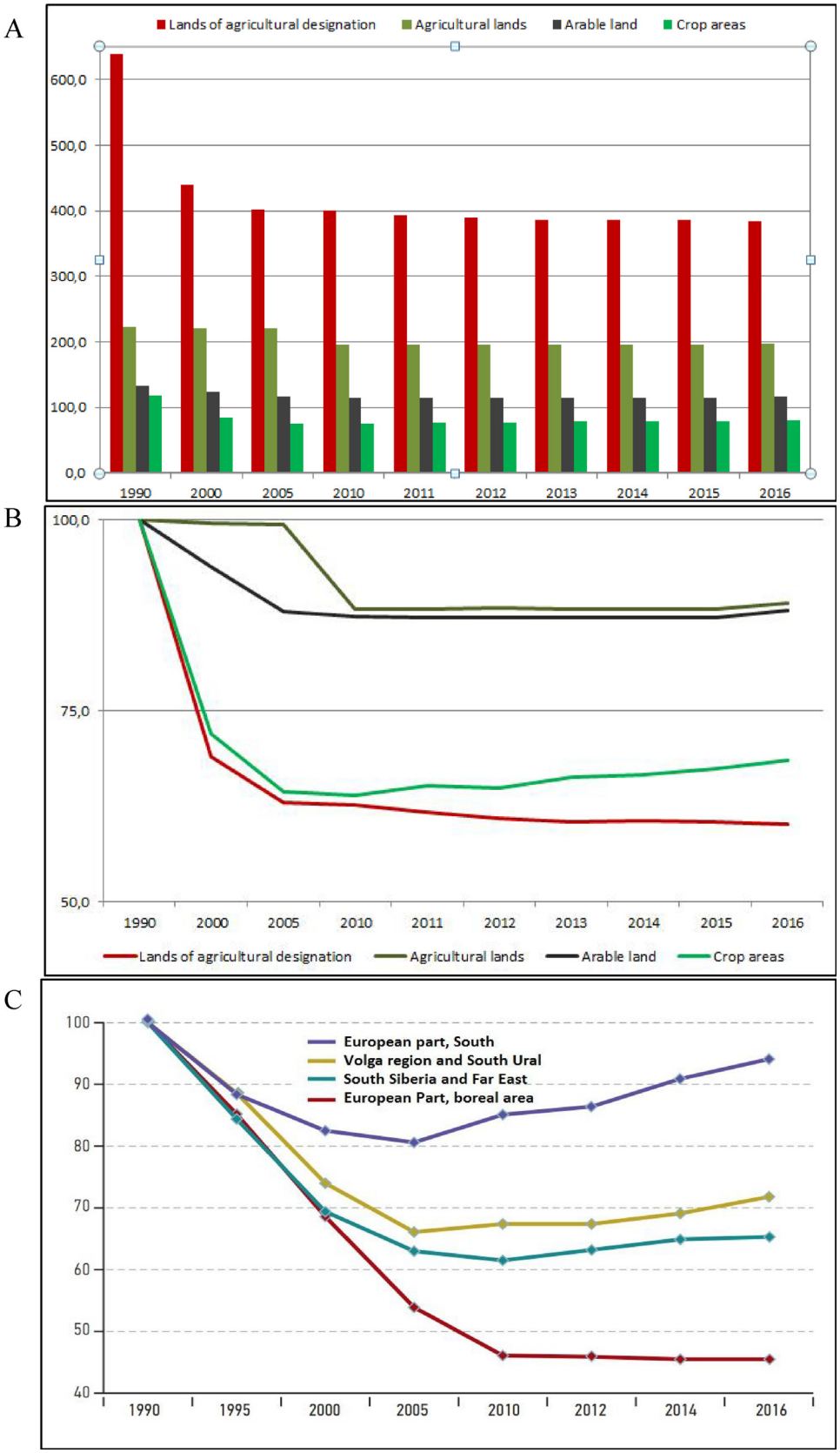

Fig. 3. Dynamics of agricultural lands in Russia, 1990–2016: **A** – million ha; **B** - % to 1990 (data for A and B obtained from Russian Federal State Statistics Service); **C** – dynamics of crop areas, % to 1990 by macro-regions of Russia (by Nefedova, 2017).

use, where processes such as soil pollution, dehumification, water and wind erosion, loss of nutrients, salinization, under-flooding and others are observed along with the complex assessment of developed lands and monitoring of crop productivity (Minselkhoz, 2015). Other land categories are provided with monitoring of technogenic disturbances and littering (Rosreestr, 2014). A forest monitoring scheme implements the assessment of changes in productivity, species composition and state of trees, and it also controls forest fires, pest invasion, logging and forestry activities (Rosleskhoz, 2011). Some land-based indicators are also used in monitoring of drought, and recently in studies of permafrost state due to climate change.

Considering only LDN core indicators implies that several processes and areas of land degradation in Russia can be completely missed or underestimated. Land with radiation poisoning or chemical pollution can also be characterized with growth in productivity and soil organic carbon content (Vodyanitskii, 2015). Identifying and mapping desertification in Russia proved that convergence of different drivers lead to the same degradation processes and vice-versa; one driver can cause different consequences (Kust et al., 2011). Such divergence of driving forces can trigger degradation in the form of drastic changes in productivity and land cover under salinization, soil compaction, and water logging of arable soils.

From this perspective, not only land degradation processes indicated by changes in land cover and productivity need ongoing monitoring, but an assessment of growing degradation risks should be also taken into account to develop adequate preventive measures. This scheme aligns well with the approach of “response hierarchy” recommended by the SCF for articulating the priorities in planning LDN interventions: Avoid > Reduce > Reverse land degradation.

In Russia, land degradation can also be caused by negative processes not considered under the UNCCD mandate, but occurring in severely affected boreal and arctic ecosystems. Among these are typical periglacial processes (thermo erosion, solifluction) and methane release from permafrost often intensified under human impacts (Anisimov et al., 2011; Pavlov and Bukvareva, 2007). The specific case is degradation of reindeer pastures through overgrazing (which leads to land cover transition from lichens and mosses to grasslands or induces soil deflation) and as a result of severe and large-scale mechanical disturbance through industrial or infrastructure activities (Krjuchkov, 1973). The percentage of degraded reindeer pastures in the late 90 s reached 67% of the total area and there have been no data indicating the reverse process since then. The complex of degradation processes revealed in the Russian Arctic was called “arctic desertification” in some Russian scientific reviews (Rostockij and Shestakov, 1992).

The expansion of degradation processes specific to the Russian territory urgently needs new response strategies. New adequate schemes of preventive, compensatory and reclamation measures for these processes should be elaborated under the approach of “response hierarchy”. Some “good practices” of such schemes have already been successfully implemented and legally established (Mosgorduma, 1999; Rosleskhoz, 1993,1995; FATRM, 2017).

3.2.3. Time period for establishing national LDN baseline in Russia

The SCF suggests establishing a baseline against which LDN is to be achieved as an average value across a period immediately prior to the adoption of the SDG target 15.3 (e.g., 2000–2015). The application of this reasonable approach in the case of Russia presents three limitations discussed hereafter.

Firstly, land cover and land productivity dynamics were very drastic and differently directed under socio-economic changes, contradictory land and policy reforms after the collapse of the Soviet Union in the early 1990s. It is clearly reflected in agricultural lands: against the backdrop of a sharp decline from 1990 to 2005, and then a more gradual one in areas of agricultural lands, the area of agricultural and arable land has remained approximately at the same level for the last 5–7 years, and the overall cropland area has expanded, especially in the south of the European part of Russia (Fig. 3). At the same time, perennial grasses and/or woody-shrub vegetation grew over the remaining fallow lands (~45% in the boreal area of European Russia and ~27% in steppe area) (Lyuri, 2015). The classifications of remote sensing derived Normalized Difference Vegetation Index (NDVI) clearly evidenced this process as "increasing productivity" and confirmed by field plot data (Kust, 2017).

It is argued that this trend in productivity growth on abandoned agricultural lands can be considered positive in terms of LDN as these lands are degraded in economic terms. The reversion of fallow lands into farming results in decrease in the average land productivity indicated from the NDVI dynamics. It was showed (Kust, 2017) that actually the NDVI time series of cultural vegetation (especially in agricultural regions using 3–4 year grain and fallow rotation scheme) indicate less annual productivity as compared to natural vegetation growing on fallow lands for over 10–15 years. Such trends of formally evaluated “negative change” in land productivity in 2000–2015 are clearly observed in the southern regions of European Russia, which experienced an active recovery of abandoned lands in recent time.

We suggest considering such fluctuations not as examples of land cover changes, but as long-term activities aimed to restore, conserve and accumulate the natural potential of arable land through reserving land for further recovery. Although fallow lands are not involved in active farming and are characterized by the formation of a new type of vegetation cover, they have not lost their potential for restoration.

Studies on long-term changes in agricultural land use in the European territory of Russia since the 19th century show that despite the complex history of wars and socio-economic crises in Russia, the fundamental and large-scale spatial patterns of agricultural areas has remained relatively stable since the second half of the 19th century. These patterns are resistant to temporary fluctuations and can quickly be restored after large-scale land abandonment (Lyuri et al., 2010). This specific feature of Russia, with a great land area suitable for agriculture allows using long-term natural processes for land restoration. At the same time, the recent growth of agricultural production is a significant challenge for these land use patterns. The investments in effective sustainable land management (SLM) approaches based on the adaptive-landscape methods (Kirjushin, 2011) is getting more efficient, similar to most countries with limited land resources.

Secondly, restoration of soil and vegetation cover in boreal and arctic ecosystems widespread in Russia, takes a time lapse greater than 15 years because of the slow biological cycle, slow growth and accumulation of biomass. The 15-year period is also quite short to observe positive land cover transitions on abandoned agricultural lands where stable climax forest ecosystems are formed only after 170–180 years in boreal zones, and in steppe region natural ecosystems regeneration takes at least 50–60 years (Lyuri et al., 2010). In disturbed tundra ecosystems, the regeneration of natural plant communities and soil cover restoration is observed after 40–100 years (Baranov et al., 2010). Regeneration of once disturbed ecosystems is often inhibited by other constant and prolonged disturbances (Kust et al., 2017).

Disturbed and degraded ecosystems are quite widespread in many industrial and agricultural areas of Russia with lack of natural ecosystems, and a variety of agricultural anthromes, pyrogenic and managed forest lands and urban areas. For such lands, it is important to define and establish the state whereby degraded or anthropogenic lands can be considered “restored”. Establishment of a baseline period for degraded lands using average values of indicators during fifteen years only (e.g. 2000–2015) can result in rather inexact assumptions in these cases given that such lands, and associated ecosystems services, need more time for the full cycle of their natural recovery. Global LDN indicators can assess their current state as neutral or positive, and such “under-restored” lands and stressed ecosystems would then lack further attention and adequate policy response. A convincing example of such a situation is the exploited and abandoned peatlands in Central Russia. Natural forest regeneration and simultaneous productivity growth were

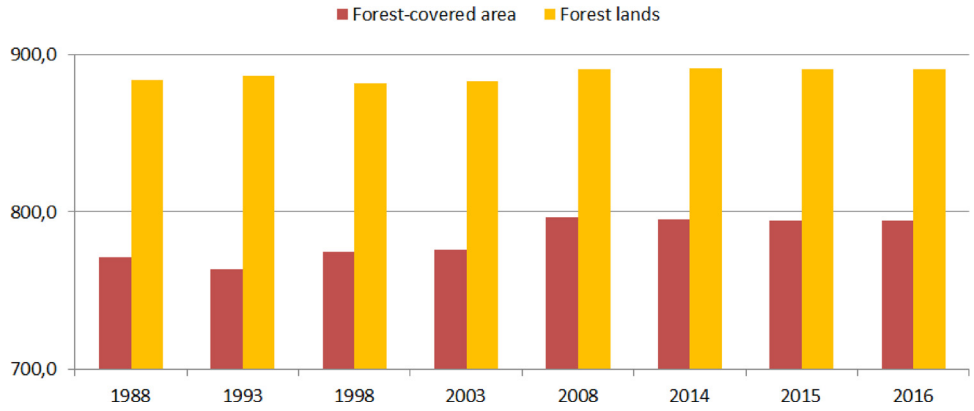

Fig. 4. Changes in total areas of total forestry land and forest-covered area in Russia, 1988–2016 (Minprirody, 2016).

steady for these lands over several decades, but the need for water-logging for proper restoration of such ecosystem (even at the expense of the rate of productivity growth) failed to be properly considered. Moreover, the extreme drought of 2010 triggered catastrophic fires (with more than 200,000 ha burned in 20 regions) (Marshev, 2011), abruptly dropping the "positive" results achieved during preceding decades.

Another example is also connected with forested areas. Forest stand growth in Russia occurred from the 1990s, but large-scale forest fires in 2014–2015 caused its stagnation (Fig. 4). According to official statistics, forest area coverage in 2016 equated 46.4% of the country area, and it was lower than the planned (46.6%) due to forest fires, pests invasion and logging activities (VNIILM, 2016). Besides that, forested areas expanded at the expense of pine and soft-wooded broadleaf species, while old areas of native forest under more valuable coniferous and hardwood species have declined.

Hence, the use of a "retrospective" approach considering a time frame longer than 15 years is recommended for the correct establishment of an LDN baseline in Russia. Such approach could also be better suited to other countries and specific geographies experiencing crises that lead to long-term land degradation or large-scale land abandonment (after wars, mass migration, economic collapse), abrupt changes in land use patterns caused by reforms in land policy and land management (land privatization or nationalization).

Thirdly, studies of soil cover evolution during the Holocene for the European territory of Russia (Kust et al., 2004), evidence that many degradation processes are predetermined by the past history of soil cover. Similar type and intensity of modern human induced soil degradation processes (salinization, alkalinization, wind erosion) are most likely to develop in areas where same natural processes occurred in the past although their features has been erased in the old days. This phenomenon is known as "genetic memory" of the soil cover. In addition to this, many natural long-term processes induced with prolonged climate changes or geologic events (e.g. Holocene drying and moistening cycles) continue to develop nowadays and have a serious impact on the dynamics of degradation phenomena. Human attempts to change the direction of these processes on a local scale (e.g. irrigation) can lower the intensity of the degradation processes but will not reverse or stop their occurrence, and in such cases aspirations to achieve LDN can fail if investments in appropriate infrastructure are insufficient.

In establishing a national LDN baseline careful consideration of context-dependent natural trends is needed. For this purpose, some additional adjustments in the form of regional-specific scales or coefficients should be elaborated and applied to setting the LDN targets and the choice of the national "response hierarchy". For example, using a context-specific qualitative scales for determination of soil organic carbon (SOC) content, in terms high-moderate-low, to cluster quantitative values of SOC concentration.

3.3. LDN indicators applicable at the national level

The applicability of global LDN indicators in Russia and their interpretation can be rather contradictory and inconsistent. This is evidenced by the underdeveloped integrated and compliant national dataset of the "state of land" indicators. Particular variables are monitored by several federal agencies and aimed at different policy tasks: for calculating and levying taxes and fines, for real estate transactions, for assessing soil fertility and for environmental assessment (Kust, 2017).

Among four base indicators of LDN, two (the proportion of degraded land from the country's area and land cover changes) cannot be replaced by national counterparts, and the best way to harmonize the national and global accounting systems might be the proposal to use global indicators as general guidelines, complemented with national land statistics.

Land productivity as an LDN indicator at the national level can be assessed using data from national statistics. For forest land, productivity can be expressed as the total forest stock of forested areas and for agricultural lands as the gross yield of main crops and annual productivity of pastures and hayfields.

A regular national survey of soil organic matter content is carried out at least every five years for agricultural lands, and it allows to trace changes in soil organic carbon (SOC) content with an accuracy superior to the data provided by the global Soil Grids dataset (Hengl et al., 2017); these global datasets have reported SOC differences with national data of 1.5–3 times, have rather low accuracy and currently cannot serve as a reliable source to indicate changes in SOC for the reference period (2000–2015). As well, the Satellite Climate Extremes Index of droughts (Zolotokrylin and Titkova, 2012), and the legally adopted in Russia "integral indicator of pollution"(FATRM, 2011) could be considered as complementary indicators for national reporting of LDN national reporting.

4. Institutional arrangements and integrated planning cycle for national LDN policy

Considerable experience has been accumulated in Russia to combat and prevent desertification, soil erosion, unfavorable transformations of natural ecosystems, and in restoring productivity on degraded lands. These activities are carried out within the framework of the State Environmental policy (RF Government, 2012) and operate within the national or regional-specific programs of federal units of the Russian Federation. For example, the Program "Land Reclamation" includes: (i) commissioning of the developed land due to reconstruction, technical upgrading and construction of new irrigation and drainage systems on the area 595,000 ha, protected from water erosion and water logging of 822,000 ha, preventive measures against wind erosion and desertification for 742,000 ha of agricultural lands, reconversion of abandoned irrigated and drained lands in the area of 667,000 ha (FCP, 2013).

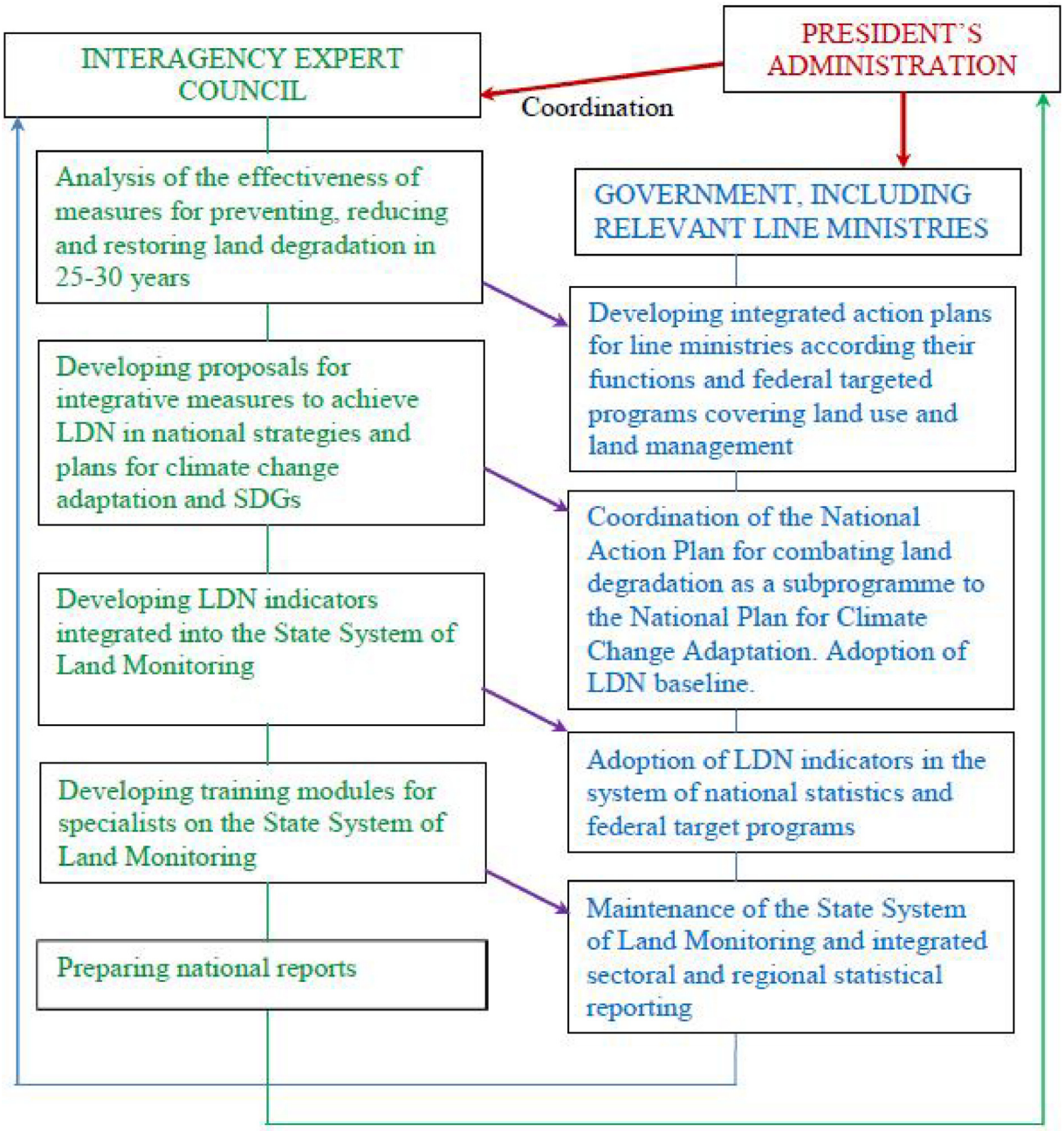
PRESIDENT`S ADMINISTRATION
INTERAGENCY EXPERT COUNCIL
Coordination
GOVERNMENT, INCLUDING RELEVANT LINE MINISTRIES
Analysis of the effectiveness of measures for preventing, reducing and restoring land degradation in 25-30 years
Developing integrated action plans for line ministries according their functions and federal targeted programs covering land use and land management
Developing proposals for integrative measures to achieve LDN in national strategies and plans for climate change adaptation and SDGs
Coordination of the National Action Plan for combating land degradation as a subprogramme to the National Plan for Climate Change Adaptation. Adoption of LDN baseline.
Developing LDN indicators integrated into the State System of Land Monitoring
Adoption of LDN indicators in the system of national statistics and federal target programs
Developing training modules for specialists on the State System of Land Monitoring
Maintenance of the State System of Land Monitoring and integrated sectoral and regional statistical reporting
Preparing national reports

Fig. 5. Conceptual model of an integrated planning cycle for national LDN policy development in Russia.

That track record explains why Russia is actively involved in the global LDN target setting project to establish national goals, and to participate in the global search for the most effective action. During 2015–2018 several cross-agency, cross-sectoral policy approaches were adopted in Russia (Ivanov et al., 2016; Bedritzkiy, 2018), stating that:

- The adoption of the LDN concept should be inseparably linked with national climate change adaptation activities;
- The achieving of LDN should consider the entire Russian territory of the state with diverse climatic conditions and socio-economic characteristics, rather than be confined to dry lands in accordance with the UNCCD mandate;
- LDN development objectives cannot be carried out only within the framework of national or sub-national target programs; such actions should include the complex of routine measures envisaged by state land monitoring system as an integral process of establishing LDN baseline in different parts of the country, and monitoring target indicators;
- For establishing spatial scales at the first stages of LDN target setting activities, existing at land cadaster system linked with administrative-territorial units would be more effective for further monitoring than considering LDN within the boundaries of landscapes or watersheds;
- The LDN concept is poorly understood by most politicians and even the expert community, as it is inconsistent with traditional national approaches. Promoting the LDN concept requires considerable effort and time to cover LDN approaches for stakeholders, including not only government and scientists, but also business and civil society.

These circumstances do not allow quick coordination and establishing of LDN targets. To provide interdisciplinary expert support to the development and adoption of the LDN-related policies connected

with climate change and sustainable development goals, mainly in agricultural and forestry sectors in Russia, the Interagency Expert Council "Global Climate and Rational Land Management: zero-emission and zero-degradation of soils" has been established. The main stages of the Council's work so far are: (i) drafting a "Comprehensive Plan to Regulate Greenhouse Gas Emissions, Technologies for Climate Change Adaptation and Achieving LDN in Agricultural and Forestry Sectors"; (ii) Preparing the National Report on "Interactions of Global Climate and Soil Cover of Russia" (2018). In the near future, a list of competitive projects for various government agencies involving business structures is expected to be developed according to the integrated planning cycle for national LDN policy development (Fig. 5), in particular:

- Justification of LDN goals at national and sub-national levels, considering regional specifics of the federal units;
- Assistance in planning actions to combat land degradation at the national and sub-national levels;
- Intersectoral harmonization of sub-laws and regulations for degraded land assessment and control;
- Development and maintenance of a unified information register of sustainable land management practices;
- Development and implementation of methods for the economics of land degradation, considering the evaluation of natural balance and environmental services for diverse land resources in Russia.

5. Conclusion

The experience in implementing and adapting the LDN concept for Russia revealed the following main uncertainties and challenges for its adoption by policy-makers:

1 High diversity of natural and socio-economic systems against the complex federal administrative-territorial structure, and a comprehensive but weakly harmonized system of state land monitoring, based on the different functions of line ministries and departments using various indicators systems. Without a concerted agreement between departmental and regional approaches within the country, it is very difficult to offer ready-made solutions for harmonizing national LDN goals at the international level.
2 Uncoordinated terminology, in particular, uncertainty related to the concepts of "land" and "land degradation" within national legislation, the absence of the concepts of "ecosystem services" and "natural capital" in the official dictionary.
3 In addition to developed agricultural and forest lands, monitoring and reliable land assessment of remote regions of the Russian North, Siberia and the Far East are needed; these regions with undisturbed forests, tundra, Arctic coast, and permafrost are ecologically fragile and deliver important global ecological functions.
4 The lack of knowledge on multidirectional and variable-speed natural and anthropogenic processes affecting land cover changes in different regions of the country is considerable for establishing a national LDN baseline.
5 The global LDN indicators cannot be directly used for Russia as a result of: (i) lack of validation with national data, (ii) limited capacity of the national system of land monitoring to replace existing traditional indices by the LDN proxy indicators. However, these LDN indicators can be added to the national land monitoring system and included in the national statistics.

Despite the aforementioned challenges, the setting preliminary national goals is achievable and can be implemented in the form of existing national programs. Such actions include statutory and regular measures aimed at preventing the reduction in land fertility, timely reforestation after logging and fires, and prevention of the latter; actions for reclamation and compensation of disturbed and contaminated land in industrial and mining regions, measures for long-term reservation of abandoned or damaged land. Additional actions to reinforce the implementation of a national LDN initiative include the development of state programs aimed at key problems related to the restoration and rehabilitation of lands degraded in the past, as well as adaptive measures for land use in regions where degradation is caused by natural changes and disasters.

The LDN approach can be used as an incentive to accelerate the agreement for land assessment and monitoring at the national level, being at the same time an effective platform for developing a system of indicators and mechanisms for land monitoring needed to make adequate and timely policy decisions.

Acknowledgements

The authors gratefully acknowledge the editors of this special issue of the "Environmental Science and Policy" and reviewers of our manuscript with personal thanks to Dr. Graciela Metternicht.

The article was developed within the project of Russian Science Foundation # 18-17-00178 "Development of a fundamental concept of Land Degradation Neutrality for assessing the effectiveness of sustainable land management and climate change adaptation", and also has been partly supported by the scientific programs of the Institute of Geography RAS #01201352471 and #01201352481, Task for expert and analytical work NI -10-23/66 by the Ministry of Natural Resources of the Russian Federation, and the scientific program of the Moscow Lomonosov State University # 116022510015-8.

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